

## **Independent CIE Report on the GARM III “Biological Reference Point (BRP)” Meeting**

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### **Introduction**

I participated in the GARM III “Biological Reference Point (BRP)” meeting at Woods Hole from 28 April to 2 May 2008 as a CIE reviewer. The statement of work and terms of reference for that meeting are attached as an Appendix. I found the meeting to be a very interesting, particularly as, although many of stocks involved are similar to what I am used to, the approach to developing scientific advice is rather different. In particular, the approach to deriving MSY reference points with a strong and consistent scientific basis contrasts with the more pragmatic approach used so far for deriving long-term targets for European stocks. Details of the latter can be found in ICES (2005).

Details of the findings of the panel in relation to the terms of reference of the meeting can be found in the panel’s consensus report. My individual comments on the work presented in relation to these terms of reference are given below.

### **1. The influence of retrospective patterns on BRP values.**

Retrospective patterns, where the initial estimates of population parameters from an assessment model show systematic bias compared to the final, converged estimates, are frequently encountered with VPA and similar models (e.g. Jónsson & Hjörleifsson, 2000). While the cause of such problems “probably involves a change over time of a quantity that has been assumed constant” (Evans, 1996), it is nonetheless not straightforward to diagnose the cause in most cases. At the GARM III meeting, using only more recent data to tune the assessments reduced the apparent extent of the retrospective bias in most cases. While splitting the survey data in this manner can only be regarded as patching the problem rather than fully resolving it, the result is that there is less uncertainty associated with the terminal estimates of population parameters.

The potential influence of retrospective bias on estimates of BRPs is dependent upon the approach used to estimate the reference points. At the GARM III BRP meeting, most  $F_{MSY}$  values were derived from SSB per recruit considerations, and thus should be relatively insensitive to uncertainty in the terminal estimates of population parameters. The derivation of  $B_{MSY}$  from MSY using the observed distribution of recruitments is potentially more sensitive to this uncertainty if the unconverged year-classes represent a relatively high proportion of the recruitment time series and

indicate a substantial change in recruitment compared to earlier years. This was not the case for any of the GARM stocks, so I have no concerns that retrospective bias has caused problems for any of the BRP values for these stocks derived during the GARM III BRP meeting.

## **2. Trends in stock productivity**

Average values over the five year period 2002 to 2006 were used for most stocks for mean weights, maturities and partial recruitments at age in the projections. This approach was intended to provide the best estimates of short to medium term stock productivity. However, while weight and maturity at age are clearly biological parameters, this is less the case for partial recruitment. This parameter, which is also known as ‘selectivity’ or ‘exploitation pattern’, is intended to represent the extent to which different age classes are subject to removal by fishing. As a result, it represents a combination of biological processes, such as growth and migration, with technical ones, such as the characteristics of the fishing gear in use and where and how it is deployed. While recent trends in growth and migration may be regarded as representative of how these may change in the short-to medium term, factors involving the gear and where and how it is deployed are unlikely to change randomly, but will instead change in response to external factors, particularly (but not exclusively) fishery management actions. This should be reflected in how partial recruitment values are selected for projections. If, for instance, a mesh size increase has recently been introduced for the main gear used for a particular species, the mean partial recruitment should only be calculated over the time period since that change was introduced, as, assuming the new mesh size is maintained, the exploitation pattern from the earlier period will no longer be indicative of future exploitation.

On a related topic,  $F_{MSY}$  is not strictly speaking a biological reference point as it is a measurement of the accumulated activity of fishing vessels rather than a biological attribute of the exploited stocks. As such, it would be useful to have more information presented on the gears used in the areas and their relative importance for each of the GARM species. This is particularly important for fishing mortality reference points as they are defined using a specified partial recruitment/exploitation pattern so they may need to be redefined if there are systematic changes in the gears in use. A specific issue related to this was highlighted for Gulf of Maine haddock, and this is discussed further in relation to the BRPs for this stock below.

## **3. Ecosystem approaches & aggregate yield**

The work presented in relation to this term of reference represented an interesting set of studies of how the single species MSYs might compare with the potential sustainable yield viewed from a whole ecosystem perspective. The broad conclusion was that the total yield that the system could sustain was likely to be less than the sum of the single stock MSYs. This raises a number of interesting questions about the management implications of these findings. The initial requirement for the estimated BRPs is to define the status of each stock, so that rebuilding measures can be put in place as necessary. The  $B_{MSYs}$  would then act as rebuilding targets. The ecosystem considerations suggest that not all stocks could be rebuilt to these targets

simultaneously. This opens the question as to whether the single stock targets should be adjusted accordingly, or whether there should be additional reference points set at the ecosystem level to define 'ecosystem rebuilding'. The potential for different stocks to rebuild at different rates also has implications for how a rebuilt ecosystem might look, for example if low value species come to dominate over the more commercially important species. However, given that most GARM stocks currently appear to be well below rebuilding targets, the likely time scales of rebuilding should allow sufficient time for more work on the ecosystem implications of the MSY approach, and for further consideration of the practical implications of these studies.

#### **4. Biological reference points.**

Most of the fishing mortality reference points for the GARM stocks were estimated using the  $F$  that produces 40% of the unfished spawning biomass per recruit as a proxy for  $F_{MSY}$ . In most cases this approach has resulted in  $F_{MSY}$  values between 0.2 and 0.27 (Figure 1). The two exceptions however, are Georges Bank haddock ( $F_{40\%SPR} = 0.34$ ) and Gulf of Maine haddock ( $F_{40\%SPR} = 0.45$ ). While values for  $F_{MSY}$  are not strictly comparable across different stocks, due to different values used for natural mortality, and for age ranges for fully recruited  $F$ , it is nonetheless striking that the  $F$ s for the two haddock stocks are substantially higher than those for the other stocks. The high value derived for the Gulf of Maine stock was identified during the meeting where it was highlighted that the value resulted from assumptions about maturity and partial recruitment at age which imply that fish reach maturity before they recruit to the fishery. While it was not identified during the meeting, this is also the case for the Georges Bank haddock.

The validity of  $F_{40\%SPR}$  as a proxy for  $F_{MSY}$  is dependent upon the assumption that spawning stock biomass is a good proxy for the reproductive potential of the stock. As Trippel (1999) notes, this is not the case. Moreover, there are specific studies of Georges Bank haddock that indicate that the proportion of first time spawners (Wigley, 1999) and possibly also adult condition (Friedland et al, 2008) influence the effectiveness of spawning for this stock. Fishing at the estimated  $F_{MSY}$  reference points for the two haddock stocks would result in spawning stocks with a high proportion of first time spawners. As a result these spawning stocks would be likely to have a lower reproductive potential than if they consisted mainly of repeat spawners.

An additional complication with the fishing mortality reference points for the two haddock stocks is that they are dependent upon the current pattern of partial recruitment being maintained. This will not necessarily be the case if, for instance, relative abundance of stocks changes in a way that makes it profitable to fish for haddock with a less selective gear. The extent to which current management measures would permit this is not clear given the lack of information about the management measures and gears in use presented at the meeting.

The use of a spawner-per-recruit approach to estimate reference points for the two haddock stocks has led to reference points that may not be consistent with current knowledge of the reproductive biology of the species, as they place too much reliance on the contribution of first-time spawners to the subsequent recruitment. One approach to address this might be to develop values using a stock reproductive potential-per-recruit approach. This could use additional weightings to reflect the

potential effectiveness of spawning by each age class, in order that the resulting F reference points more adequately reflect current scientific knowledge for these stocks.

## **5. Models for forecasting**

Other than the comment in working paper 4.2 on the need to consider using different recruitment scenarios for short and long-term projections, no analyses were tabled that explicitly addressed ToR 5.

## **References**

Evans, G. T. 1996. Using the elementary operations of sequential population analysis to display problems in catch or survey data. *Canadian Journal of Fisheries and Aquatic Sciences*, 53: 239–243.

Friedland, K.D., Hare, J.A., Wood, G.B., Col, L.A., Buckley, L.J., Mountain, D.G., Kane, J., Brodziak, J., Lough, R.G. and Pilskaln, C.H. (2008) Does the fall phytoplankton bloom control recruitment of Georges Bank haddock, *Melanogrammus aeglefinus*, through parental condition? *Canadian Journal of Fisheries Science*, 65, 1076-1086.

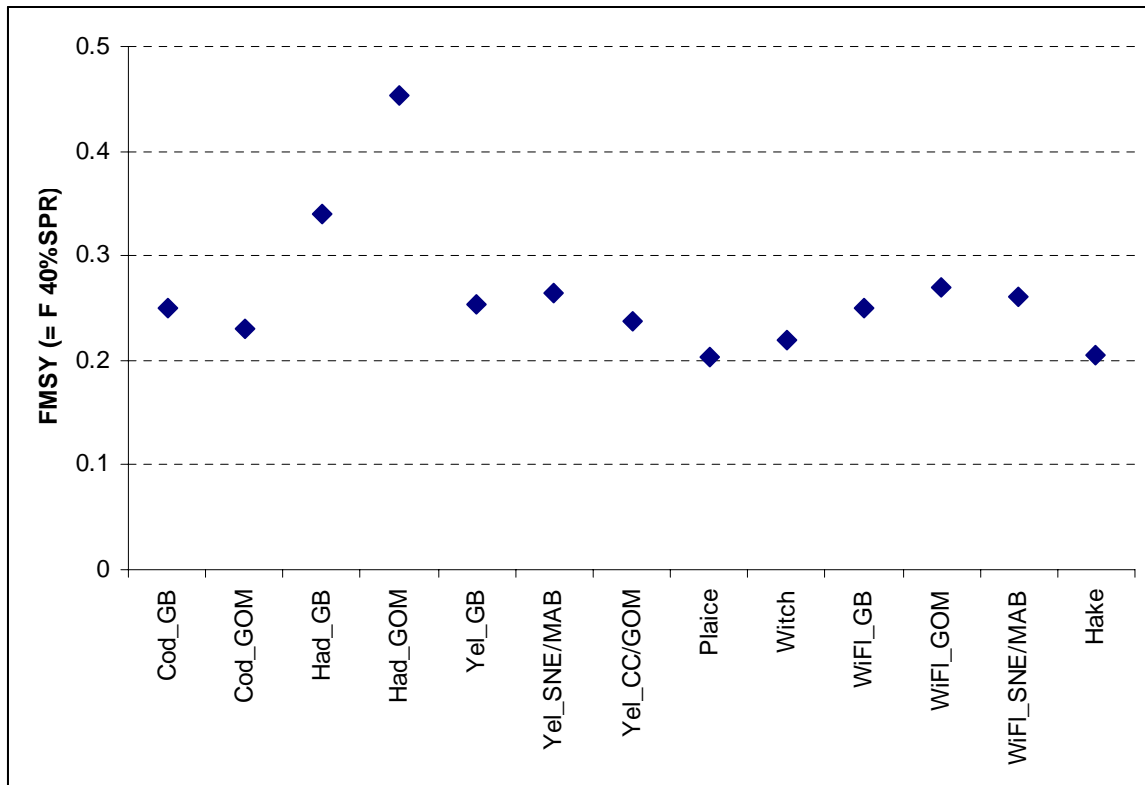
ICES (2005) Report of the *Ad hoc* group on long term advice (AGLTA). ICES CM 2005/ACFM:25

Jónsson, S., and Hjörleifsson, E. 2000. Stock assessment bias and variation analyzed retrospectively and introducing the PA-residual. ICES Document CM 2000/X:9

Trippel, E.A.(1999) Estimation of Stock Reproductive Potential: History and Challenges for Canadian Atlantic Gadoid Stock Assessments. *Journal of Northwest Atlantic Fisheries Science*, 25, 61-81.

Wigley, S.E. (1999) Effects of First-time Spawners on Stock-recruitment Relationships for two Groundfish Species. *Journal of Northwest Atlantic Fisheries Science*, 25, 215-218.

**Figure 1,** FMSY values for GARM stocks where F40%SPR has been used as a proxy for FMSY.



## **Appendix 1: Statement of Work for Stuart Reeves (CEFAS)**

### **External Independent Peer Review by the Center for Independent Experts**

#### **GARM-III “Biological Reference Point” Meeting:**

**Meeting Date: April 28 – May 2, 2008**

*Statement of Work (SOW) for CIE Panelists*

*(including description of GARM-III Chairman’s duties)*

#### **General**

The Groundfish Assessment Review Meeting (GARM) brings together stock assessment experts to peer review work on the status of 19 important fish stocks that are managed by the New England Fishery Management Council. GARM-III takes place in 2007-2008, and it will consist of four meetings that are cumulative in nature (i.e., successive meetings incorporate methods and results that were accepted at previous GARM-III meetings). Each meeting will have a chair as well as external panelists. A brief description and dates of the four GARM-III meetings are given below:

**1. “Data Methods” Meeting (October 29 – November 2, 2007)**

Review the commercial and survey data that will be used in the stock assessments. Identify appropriate statistical methods for analyzing those data (including bycatch and discard issues, changes in growth rates and other life history traits, issues related to merging databases, etc.). Other sources of data to be considered are tagging programs for cod and yellowtail flounder, and Industry-Based Surveys. Candidate sources of data relevant to ecological and ecosystem considerations will also be described.

**2. “Modeling” Meeting (February 25 – 29, 2008)**

Determine the most appropriate stock assessment methods and models for each of the 19 stocks. Perform runs of those models to obtain results (historical and current estimates of F and B) based on commercial and survey data, probably through calendar year (CY) 2006. The runs of the models will be used to evaluate diagnostics of model fit and appropriateness, including retrospective analyses.

**3. “Biological Reference Point (BRP)” Meeting (April 28 – May 2, 2008)**

Update or redefine BRPs for each of the 19 stocks. Use data available through CY2006. Consider whether the BRPs are reasonable in light of results from the “Modeling” Meeting. Define the appropriate initial conditions for forecasting and rebuilding strategies, particularly with respect to trends in biological attributes, recruitment and survival rates. Comment on relevant ecosystem considerations as they relate to rebuilding strategies.

**4. GARM-III “Final” Meeting (August 4 - 8, 2008)**

Use all of the methods proposed from the previous three meetings, along with survey and catch information through CY2007, to estimate historical

and current fishing mortality rates and biomass for each stock. Based on procedures from the BRP Meeting, finalize the BRPs, appropriate initial conditions, and biological assumptions related to forecasts. Determine the status of each stock.

**This SOW applies specifically to the GARM-III “Biological Reference Point (BRP)” Meeting, which will take place at the Woods Hole Laboratory of the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts, from April 28 – May 2, 2008. The meeting will have a chairman (non-CIE) as well as external panelists, three of whom will be provided by the Center of Independent Experts (CIE).**

### **Overview of CIE Peer Review Process:**

The Office of Science and Technology implements measures to strengthen the National Marine Fisheries Service’s (NMFS) Science Quality Assurance Program (SQAP) to ensure the best available high quality science for fisheries management. For this reason, the NMFS Office of Science and Technology coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service management decisions.

The NMFS Office of Science and Technology serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact.

### **Requirements for CIE Reviewers:**

Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the Terms of Reference (ToR) herein. Each CIE reviewer’s duties

shall not exceed a maximum of 14 days conducting pre-review preparations with document review, participation on the GARM panel review meeting, editorial assistance to the GARM Chair, and completion of the CIE independent peer review report in accordance with the ToR and Schedule of Milestones and Deliverables. CIE reviewers shall have working knowledge and recent experience in the application of modern fishery stock assessment models. Reviewers should have experience in development of biological reference points that includes knowledge for the varying quality and quantity of data available to support estimation for individual fish species living within the ecosystem. Expertise should include statistical catch-at-age, traditional VPA approaches, and index-based methods. Desirable background includes life-history theory, risk analyses, stock-forecasting methodology, and ecosystem fisheries ecology. Some experience with groundfish (such as cod, haddock, flounder) population dynamics would be useful.

### **Specific Activities and Responsibilities**

The CIE's deliverables shall be provided according to the schedule of milestones listed on page 6. The GARM Chair will use contributions from the CIE panelists, as well as from other external panelists, to produce the GARM Panel Summary Report. In addition, each CIE panelist will write an individual independent report. These reports will provide peer-review information for a presentation to be made by NOAA Fisheries at meetings of the New England and Mid-Atlantic Fishery Management Councils in 2008. The GARM Panel Summary Report shall be an accurate representation of the GARM panel viewpoint on the quality and soundness of the science, methods and results with regard to each Term of Reference (see Annex 1). The report shall also contain recommendations for improvement that might be implemented in a future GARM meeting.

### **Charge to GARM panel**

The panel is to determine and write down its viewpoint on the quality and soundness of the science, methods and results with regard to each Term of Reference (see Annex 1). Criteria to consider include whether: (1) the data are adequate and were used properly; (2) the analyses and models were appropriate and correctly accomplished; and (3) the conclusions are correct/reasonable. Where possible, the chair shall identify or facilitate agreement among the panelists regarding each Term of Reference.

During the course of the review, the panel is allowed limited flexibility to deviate from the results and recommendations of earlier GARM-III meetings. This flexibility may include only minor alterations in procedures previously established at the peer review of the "Data Methods" Meeting in October 2007 and the "Modeling" Meeting in February 2008. Large scale changes, such as changing a stock definition would not be possible in view of the difficulties of implementing these changes in time available before the final GARM meeting in August 2008.

Furthermore, if the panel rejects certain assessment models or Biological Reference Points (BRP), the panel should explain why they are not suitable, and the panel should recommend suitable alternatives. If such alternatives cannot be identified, then the



panel should indicate that the existing (status quo) models and/or BRPs are the best available at this time.

## **Roles and responsibilities**

### **(1) Prior to the meeting**

(GARM Chair and CIE panelists)

Background reports will be provided to the CIE reviewers in advance of the GARM review meeting.

### **(2) During the Open meeting**

(GARM Chair)

Act as chairperson, where duties include control of the meeting, coordination, facilitation of the presentations and discussions, and ensuring that all Terms of Reference of the GARM are reviewed and completely addressed.

During the question and answer periods, provide appropriate feedback to the assessment scientists on the sufficiency of the analyses and when possible, suggest improved approaches. It is permissible to discuss the working papers, and to request additional information to clarify or revise existing analyses, if that information can be produced rather quickly.

(CIE panelists)

Participate in panel discussions on the quality and soundness of the science, methods and results with regard to each Term of Reference (see Annex 1).

During the question and answer periods, provide appropriate feedback to the assessment scientists on the sufficiency of the analyses. It is permissible to request additional information if it is needed to clarify or revise existing analyses, if that information can be produced rather quickly.

### **(3) After the Open meeting**

(GARM Chair, CIE and non-CIE panelists)

The GARM Chair will lead preparing, editing, and completing the GARM Panel Summary Report, based on contributions from the panelists (CIE and non-CIE). This report (see Annex 3 for information on contents) is to comment on the quality and soundness of the science, methods, and results with regard to each Term of Reference. If any modeling approaches and/or BRPs are considered inappropriate, the GARM Panel Summary Report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing modeling approaches and/or BRPs are the best available at this time.

The panelists and the chair will discuss whether their views on each Term of Reference can be summarized into a consensus conclusion. In cases where multiple, differing views exist on a given Term of Reference, the GARM

Panel Summary Report will note that there was no consensus and will summarize the various opinions and the reason(s) for these.

(GARM Chair)

The Chair's role during GARM Panel Summary Report development will be to facilitate rather than to force consensus from the panel.

The GARM Chair shall prepare the introduction to the GARM Panel Summary Report, summarizing the background of the work to be conducted as part of the review process, and whether the process was adequate to successfully address the Terms of Reference. As appropriate, the chair will include suggestions (in an Appendix) on how to improve the process.

The GARM chair will finalize all editorial and formatting changes of the draft GARM Panel Summary Report prior to its final approval by all panelists. The GARM chair will then submit the approved GARM Panel Summary Report to the NEFSC contact (i.e., SAW Chair).

(GARM CIE panelists)

Each CIE panelist shall prepare a CIE independent peer review report (see Annex 2). This report should comment on the quality and soundness of the science, methods, and results with regard to each Term of Reference.

If any modeling approaches and/or BRPs are considered inappropriate, the CIE independent peer review report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing modeling approaches and/or BRPs are the best available at this time.

During the meeting, questions which are not in the Terms of Reference but are directly related to the meeting may have been raised. Questions not explicitly referenced in the TOR but relevant to its intent can be documented and addressed.

## Schedule of Milestones and Deliverables

The milestones and schedule are summarized in the table below. No later than May 16, 2008, the CIE panelists should submit their CIE independent peer review reports to the CIE for review<sup>1</sup>. The CIE reports shall be sent to “University of Miami Independent System for Peer Review,” and sent to Dr. David Sampson, via e-mail to [David.Sampson@oregonstate.edu](mailto:David.Sampson@oregonstate.edu) and to Mr. Manoj Shrivani via e-mail to [mshrivani@ntvifederal.com](mailto:mshrivani@ntvifederal.com)

Milestone	Date
CIE reviewers attend GARM workshop to conduct peer review at Northeast Fisheries Science Center (NEFSC) in Woods Hole, MA, USA	April 28 – May 2
GARM Chair and CIE panelists work at the NEFSC drafting reports. Report writing starts during the meeting. Panelists leave meeting with at least the summary bullets.	May 1 - 2
Draft of GARM Panel Summary Report, reviewed by all panelists, due to the GARM Chair **	May 16
CIE panelists submit CIE independent peer review reports to CIE for approval	May 16
GARM Chair sends Final GARM Panel Summary Report, approved by CIE panelists, to NEFSC contact (i.e., SAW Chairman)	May 23
CIE provides reviewed CIE independent peer review reports to NMFS COTR for approval	May 30
COTR notifies CIE of approval of CIE independent peer review reports	June 6 *
COTR provides final CIE independent peer review reports to NEFSC contact	June 6

\* Assuming no revisions are required of the reports.

\*\* The GARM Panel Summary Report will not be submitted, reviewed, or approved by the CIE.

The SAW Chairman will assist the GARM chairman prior to, during, and after the meeting in ensuring that documents are distributed in a timely fashion. NEFSC staff and the SAW Chairman will make the final GARM Panel Summary Report and CIE independent peer review reports available to the public. Staff and the SAW Chairman will also be responsible for production and dissemination of the collective Working Group papers.

## Acceptance of Deliverables:

Upon review and acceptance of the CIE reports by the CIE Coordination and Steering Committees, CIE shall send via e-mail the CIE reports to the COTRs (William Michaels [William.Michaels@noaa.gov](mailto:William.Michaels@noaa.gov) and Stephen K. Brown [Stephen.K.Brown@noaa.gov](mailto:Stephen.K.Brown@noaa.gov)) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE report in \*.PDF format to the

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<sup>1</sup> All reports will undergo an internal CIE review before they are considered final.

COTRs. The COTRs at the Office of Science and Technology have the responsibility for the distribution of the final CIE reports to the Project Contacts.

## **Key Personnel:**

### Contracting Officer's Technical Representative (COTR):

William Michaels  
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### Contractor Contacts:

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10600 SW 131<sup>st</sup> Court, Miami, FL 33186  
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### Project Contact:

James Weinberg, NEFSC Contact person and SAW Chairman  
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## **Request for Changes:**

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect any approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

## ANNEX 1:

### **Draft Terms of Reference for the GARM-III “Biological Reference Point (BRP)” Meeting**

*(Last Revised: 1/11/08; A final draft will be distributed to the Panel prior to the meeting.)*

1. For relevant stocks, determine the influence of retrospective patterns in parameter estimates (e.g., fishing mortality, biomass, and/or recruitment) from assessment models on the computation of BRPs and on specification of initial conditions for forecasting.
2. Trends in Stock Productivity:
  - a.) For relevant stocks, identify trends in biological parameters (i.e., life history and/or recruitment) and assess their importance for the computation of BRPs and for specification of rebuilding scenarios;
  - b.) If possible, summarize trends in pertinent environmental variables that might be related to the trends in those biological parameters relevant to BRPs.
3. Ecosystem approaches to Gulf of Maine/Georges Bank fisheries:
  - a.) Determine the production potential of the fishery based on food chain processes and estimate the aggregate yield from the ecosystem;
  - b.) Comment on aggregate single stock yield projections in relation to overall ecosystem production, identifying potential inconsistencies between the two approaches.
4. Biological Reference Points ( $B_{\text{target}}$ ,  $B_{\text{threshold}}$ ,  $F_{\text{target}}$ ,  $F_{\text{threshold}}$ ):
  - a.) For each stock, list what the current BRPs and/or BRP Proxies are (e.g.,  $B_{\text{MSY}}$ ,  $B_{\text{MAX}}$ ,  $F_{\text{MSY}}$ ,  $F_{40\% \text{MSP}}$ , historical survey catch per tow, etc.), and give their values (i.e., typically from GARM II);
  - b.) For each stock, update or redefine BRPs or BRP proxies that will be used for stock status determination, and compute their expected values and precision. Note: These BRPs and their proxies must be comparable and consistent with outputs from the recommended assessment models from the GARM III “Modeling” Meeting.
5. For each stock, identify appropriate models for forecasting and for evaluating rebuilding scenarios.

## **ANNEX 2:**

### **Contents of GARM-III CIE independent peer review report**

1. The Independent CIE Report should comment on the quality and soundness of the science, methods and results with regard to each Term of Reference. CIE panelists should consider whether the work provides a scientifically credible basis for developing fishery management advice. Scientific criteria to consider include: whether the data were adequate and used properly, the analyses and models were carried out correctly, and the conclusions are correct/reasonable.
2. If any modeling approaches and/or BRPs are considered inappropriate, the Independent CIE Report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing modeling approaches and/or BRPs are the best available at this time.
3. Any independent analyses conducted by the CIE panelists as part of their responsibilities under this agreement should be incorporated into their Independent CIE Reports. It would also be helpful if the details of those analyses (e.g., computer programs, spreadsheets etc.) were made available to the respective assessment scientists.
4. Additional questions that were not in the Terms of Reference but that are directly related to the meeting can be addressed. This section need only be included if additional questions were raised during the GARM meeting.
5. The report shall include a copy of the Statement of Work with Terms of Reference and meeting agenda attached as appendices.

## **ANNEX 3:**

### **Contents of GARM-III Panel Summary Report**

1. The first section the report shall consist of an introduction prepared by the GARM chair that will include the background, a review of activities and comments on the appropriateness of the process in reaching the goals of the GARM. The next section will contain comments on the quality and soundness of the science, methods and results with regard to each Term of Reference. The GARM Panel should consider whether the work provides a scientifically credible basis for developing fishery management advice. Scientific criteria to consider include: whether the data were adequate and used properly, the analyses and models were carried out correctly, and the conclusions are correct/reasonable.

If the CIE panelists, the non-CIE panelists and GARM chair do not reach an agreement on a Term of Reference, the report should explain why. It is permissible to express majority as well as minority opinions.

2. If any modeling approaches and/or BRPs are considered inappropriate, the GARM Panel Summary Report should include recommendations and justification for suitable alternatives. If such alternatives cannot be identified, then the report should indicate that the existing modeling approaches and/or BRPs are the best available at this time.

3. The report shall also include: a.) the bibliography of all materials provided during the meeting and any papers cited in the GARM Panel Summary Report; and separate appendices with b.) a copy of the CIE Statement of Work; c.) the assessment with the Terms of Reference used for the GARM BRP Meeting, including any changes to the Terms of Reference or specific topics/issues directly related to the assessments and requiring Panel advice; d.) a list of participants; e.) the meeting agenda, f.) a list of working papers; and g.) Presentation Highlights and Meeting Discussion Summary for each working paper. The Highlights and Discussion Summary are to be written by the assessment scientists and rapporteurs, respectively, with editing and oversight by the GARM Chairman.

## Appendix 2

### Meeting Agenda (last revised April. 27, 2008, noon)

#### GARM III Biological Reference Points Meeting: April 28-May 2, 2008

Date /Day	Start	End	Duration (min)	Topic	Presenter	Rapporteur
28-Apr	9:00	9:10	10	Introduction	Weinberg	
1	9:10	9:30	20	Overview of GARM/ meeting objectives	GARM Chair	
				<b>TOR #4 Biological Reference Points: a.Current values and proxies</b>		
1	9:30	9:45	15	WP 4.1 Overview of current BRPs methods and estimates	Rago	Brooks
1	9:45	10:00	15	Discussion		
				<b>WP 4.2 Setting SSBmsy via Stochastic Simulation Ensures Consistency with Rebuilding Projections. Chris Legault</b>	Legault	Brooks
1	10:00	10:30	30			
1	10:30	10:45	15	Break		
1	10:45	11:00	15	Discussion		
				<b>TOR #2: Trends in Stock Productivity</b>		
				<b>WP 2.1 Trends in Average length, weight and maturity at age for relevant stocks and trends in environmental variables.</b>	O'Brien	Blaylock
1	11:00	11:45	45			
1	11:45	12:00	15	Discussion		
				<b>WP 2.2 Implications of biological trends for estimation of biological reference points and rebuilding schedules.</b>	Rago et al	Blaylock
1	12:00	12:15	15			
1	12:15	12:30	15	Discussion		
1	12:30	13:30	60	Lunch		
Date /Day	Start	End	Duration (min)	Topic	Presenter	
				<b>TOR #3 Ecosystem Approaches to Gulf of Maine/Georges Bank Fisheries</b>		
				<b>WP 3.1 US Northeast Shelf LME Biomass, target biological reference points for fish and worldwide cross-system comparisons. Overholtz, Link, Fogarty, Col, Legault.</b>	Overholtz	Chute
1	13:30	13:50	20			
1	13:50	14:00	10	Discussion		
				<b>WP 3.2 Energy Budget contextualization of fish biomasses at B MSY</b>	Link	Chute
1	14:00	14:20	20			
1	14:20	14:30	10	Discussion		
				<b>WP 3.3 Estimates of aggregate surplus production for the GARM and other stock groups for the US Northeast Shelf LME. Overholtz, Fogarty, Link, Legault, Col.</b>	Overholtz	Chute
1	14:30	14:50	20			
1	14:50	15:00	10	Discussion		
1	15:00	15:15	15	Break		
				<b>WP 3.4 An Aggregate and MS Production Model: A Simulator Tool</b>	Link	Jacobson
1	15:15	15:35	20			
1	15:35	15:45	10	Discussion		
				<b>WP 3.5 Fishery Production Potential</b>	Fogarty	Jacobson
1	15:45	16:10	25			
1	16:10	17:00	50	Discussion—WP 3.6 Synthesis: Implications for single species reference points	Link/Fogarty	Jacobson
				<b>TOR #4 Biological Reference Points:</b>		
				<b>WP 4.3. Sensitivity of the Long-term Observation-error Survey Series (LOSS) model to variable stock-recruit steepness and stock depletion inputs: A test case using Gulf of Maine haddock (Palmer and Legault).</b>	Palmer/Legault	Shepherd
1	17:00	17:15	15			
1	17:15	17:25	10	Discussion		
				<b>WP 4.7 (Supplementary WP) Size-specific tag recovery rates of cod and implications for estimation of fishing mortality in analytical models. Miller and Hart</b>	Miller/Hart	Shepherd
1	17:25	17:40	15			
1	17:40	17:50	10	Discussion		
1	17:50	18:00	10	Summary/Followup (Chair)		



<i>Date /Day</i>	<i>Start</i>	<i>End</i>	<i>Duration (min)</i>	<i>Topic</i>	<i>Presenter</i>	<i>Rapporteur</i>
29-Apr	9:00	9:15	15	Progress review and Order of the Day (Chair)	Chair	
				TOR #1 Influence of retrospective patterns on parameter estimates and specification of initial conditions for forecasting.		
2	9:15	9:35	20	WP 1.1 Specifying Initial Conditions for Forecasting When Retrospective Pattern is Present.	Legault/ Terceiro	Miller
2	9:35	9:50	15	Discussion		
2	9:50	10:10	20	WP 1.2 A simulation study to evaluate estimation of biological reference points from VPA and ASAP.	Brooks/ Legault/ Seaver	Miller
2	10:10	10:25	15	Discussion		
2	10:25	10:40	15	Break		
				TOR #4 Biological Reference Points: b. Update by stock		
2	10:40	11:25	45	WP 4.A Georges Bank Cod	O'Brien	Wigley
2	11:25	11:55	30	Discussion		
2	11:55	12:55	60	Lunch		
2	12:55	13:40	45	WP 4.F Gulf of Maine Cod	Mayo	Wigley
2	13:40	14:05	25	Discussion		
2	14:05	14:30	25	WP 4.F.1 Gulf of Maine Cod	Butterworth	Wigley
	14:30	14:40	10	Discussion		
2	14:40	15:30	50	WP4.B Georges Bank Haddock	Brooks	Mayo
2	15:30	15:55	25	Discussion		
2	15:55	16:10	15	Break		
2	16:10	17:05	55	WPs 4.C Georges Bank + 4.D Southern New England + 4.E Cape Cod-Gulf of Maine Yellowtail Flounder	Legault	Hendrickson
2	17:05	17:50	45	Discussion		
2	17:50	18:00	10	Summary/Followup	Chair	
<i>Date /Day</i>	<i>Start</i>	<i>End</i>	<i>Duration (min)</i>	<i>Topic</i>	<i>Presenter</i>	<i>Rapporteur</i>
30-Apr	9:00	9:15	15	Progress review and Order of the Day (Chair)	Chair	
3	9:15	10:00	45	WP 4.N Gulf of Maine/ Georges Bank Acadian Redfish	Miller	Brooks
3	10:00	10:15	15	Discussion		
3	10:15	11:00	45	WP 4.K Georges Bank Winter Flounder	Hendrickson	Sosebee
3	11:00	11:15	15	Break		
3	11:15	11:30	15	Discussion		
3	11:30	12:30	60	WP 4.I Gulf of Maine Winter Flounder	Nitschke	Sosebee
3	12:30	12:45	15	Discussion		
3	12:45	13:45	60	Lunch		
3	13:45	14:30	45	WP 4.J Southern New England Winter flounder	Terceiro	Alade
3	14:30	14:45	15	Discussion		
3	14:45	15:30	45	WP 4.G Witch Flounder	Wigley	Col
3	15:30	15:45	15	Discussion		
3	15:45	16:00	15	Break		
3	16:00	16:45	45	WP 4.H Gulf of Maine/Georges Bank American Plaice	O'Brien	Richards
3	16:45	17:00	15	Discussion		
3	17:00	17:30	30	WP 4.M Georges Bank/Gulf of Maine Pollock	Mayo	Richards
3	17:30	17:45	15	Discussion		
3	17:45	18:00	15	Summary/Followup	Chair	
	19:30	22:30		Social/Dinner --British Beer Company, Falmouth Heights		

<i>Date /Day</i>	<i>Start</i>	<i>End</i>	<i>Duration (min)</i>	<i>Topic</i>	<i>Presenter</i>	<i>Rapporteur</i>
1-May	9:00	9:15	15	Progress review and Order of the Day	Chair	
4	9:15	10:05	50	WP 4.L White Hake	Sosebee	Palmer
4	10:05	10:20	15	Discussion		
4	10:20	10:35	15	Break		
	10:35	10:55	20	WP.4.L.1 White Hake alt	Butterworth	Palmer
	10:55	11:05	10	Discussion		
4	11:05	12:00	55	WP 4.R Gulf of Maine Haddock	Palmer	Mayo
4	12:00	12:15	15	Discussion		
4	12:15	13:15	60	Lunch		
4	13:15	13:35	20	WP 4.O Ocean Pout	Wigley	Col
4	13:35	13:45	10	Discussion		
4	13:45	14:05	20	WP 4.P Gulf of Maine/Georges Bank Windowpane Flounder	Hendrickson	Chute
4	14:05	14:15	10	Discussion		
4	14:15	14:35	20	WP 4.Q Southern New England – Mid-Atlantic Windowpane	Hendrickson	Chute
4	14:35	14:45	10	Discussion		
4	14:45	15:05	20	WP 4.S Atlantic Halibut	Col	Alade
4	15:05	15:15	10	Discussion		
4	15:15	15:30	15	Break		
4	15:30	17:50	140	Review/Revisions/Follow-up	TBD	
4	17:50	18:00	10	Summary/Followup (Chair)	Chair	
2-May	9:00	9:30	30	Progress review and Order of the Day	Chair	
5	9:30	10:30	60	Review of Outstanding Issues as necessary	TBD	
5	10:30	10:45	15	Break		
5	10:45	12:00	75	Report Development [CLOSED]		
5	12:00	13:00	60	Lunch		
5	13:00	16:00	180	Report Development, Summary and Assignments [CLOSED]		
5	16:00	16:00	0	Adjourn		

